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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,681	02/28/2004	Ut-Va Koc	3-1	7543

7590 03/23/2005

Lucent Technologies Inc.
Docket Administrator (Room 3J-219)
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EXAMINER	
WILLIAMS, HOWARD L	
ART UNIT	**PAPER NUMBER**
2819	

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/789,681	KOC ET AL.	
	Examiner	Art Unit	
	Howard L. Williams	2819	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

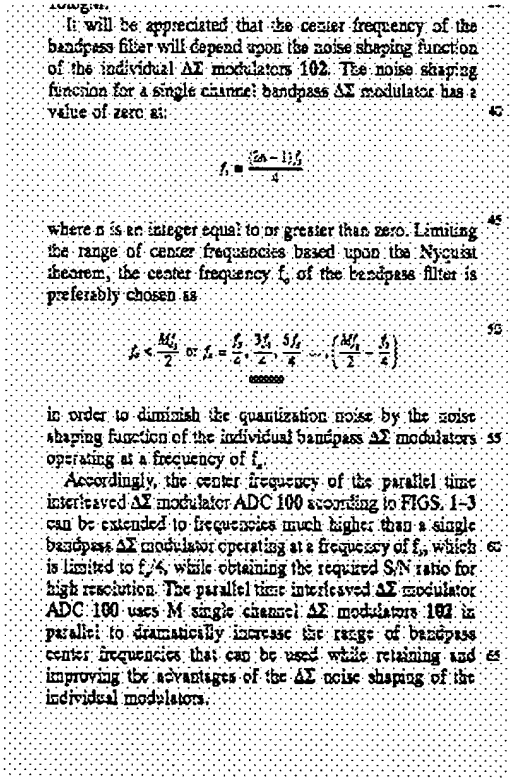
1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *022804*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The examiner acknowledges receipt of the information disclosure statement on 28 February 2004. An intialed copy of the citation form (2 pages) should accompany this letter.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 4, 5, 7, 11-13 and 15-17 are rejected under 35 U.S.C. 102(b) as anticipated by U.S. Patent 6,518,905 B2 to Siferd. Siferd discloses an interleaved bandpass delta-sigma ADC system for conversion of IF signals. The interleaving permits Siferd to obtain a higher effective sampling rate by placing slower bandpass delta-sigma in parallel with each other. Siferd discloses a sequence of sampling frequencies to center frequency ratios driven by the number of modulators. Siferd discloses in column 7 about line 50 that the center frequency can be related to the sampling frequency $f_C = 3f_S/4$. See clipped image of column 7 on the left. The delta-sigma modulator is depicted in figure 3 and comprises filter Hz, quantizer 162, DAC 168 for feedback.



It will be appreciated that the center frequency of the bandpass filter will depend upon the noise shaping function of the individual ΔΣ modulators **102**. The noise shaping function for a single channel bandpass ΔΣ modulator has a value of zero at:

$$f_n = \frac{(2n-1)f_s}{4}$$

where n is an integer equal to or greater than zero. Limiting the range of center frequencies based upon the Nyquist theorem, the center frequency f_n of the bandpass filter is preferably chosen as

$$f_n < \frac{Mf_s}{2} \text{ or } f_n = \frac{f_s}{2}, \frac{3f_s}{2}, \frac{5f_s}{4} \ldots \left\{\frac{Mf_s}{2} - \frac{f_s}{4}\right\}$$

in order to diminish the quantization noise by the noise shaping function of the individual bandpass ΔΣ modulators operating at a frequency of f_s.

Accordingly, the center frequency of the parallel time interleaved ΔΣ modulator ADC 100 according to FIGS. 1-3 can be extended to frequencies much higher than a single bandpass ΔΣ modulator operating at a frequency of f_s, which is limited to $f_s/4$, while obtaining the required S/N ratio for high resolution. The parallel time interleaved ΔΣ modulator ADC 100 uses M single channel ΔΣ modulators **102** in parallel to dramatically increase the range of bandpass center frequencies that can be used while retaining and improving the advantages of the ΔΣ noise shaping of the individual modulators.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 6, 8-10, 14 and 18 are rejected under 35 U.S.C. 103(a) as unpatentable over U.S. Patent 6,518,905 B2 to Siferd in view of Shoaei et al. article Design and Implementation of a Tunable 40 MHz-- 70 MHz Gm-C Bandpass ΔΣ Modulator. Maurino et al. teach the benefits of higher-order modulators and provides a basic sampling frequency to center frequency ratio of $nf_S \pm f_O$ using a fourth order modulator. Maurino also discloses the beneficial use of return-to-zero DACs as providing high linearity partly due to the reduced energy carried by the DAC pulse.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Helkey (US 6,469,649 B1) discusses a delta-sigma ADC with higher order and sampling frequency (quantization frequency) to filter center of Fs/4.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard L. Williams at telephone number (571) 272-1815.

3/17/05
Voice: (571) 272-1815

Howard L. Williams
Primary Examiner
Art Unit 2819